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Docket No. 56296 (71360)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT: Sadao HAGA, et al

U.S.S.N.: 09/916,381 EXAMINER: Lynette T. Umez-Eronini

FILED: July 27, 2001 GROUP ART UNIT: 1765

FOR: MIXED ACID SOLUTION IN ETCHING PROCESS

COMMISSIONER OF PATENTS
P.O.Box 1450
ALEXANDRIA, VA 22313-1450

DECLARATION OF Katsuji ITOU
UNDER 37 C.F.R. 1.132

Dear Sir:

1. I, Katsuji ITOU, declare and say that I am a resident of Japan. My resident address is 120-5, Shiomidai, Kanayamamachi, Iwaki-shi, Fukushima-ken, Japan.

2. I currently hold the position of Technical Adviser for a technical guidance and advice relating to chemicals for electric industries used in a production of semiconductor devices.

3. I have read and am familiar with U.S. Patent Application, Serial No. 09/916,381 ("the '381 application") and certain work related to the invention described in that application.

2. Under my supervision and control, certain experiments were conducted, as described below.

5. EXPERIMENT 1: Using an apparatus for producing acid etching solutions, as shown in Fig 1 of the '381 application, 780 g of silicon was dissolved in a mixed acid solution obtained by absorbing and mixing 3,500 g of a hydrogen fluoride gas with 6,500 g of 70% (by weight) nitric acid, thereby obtaining an etching solution. The composition of the etching solution obtained is as follows.

Hydrofluoric acid: 1.8% by weight
Nitric acid: 11.6% by weight
Hexafluorosilicic acid: 42.7% by weight
Water: Balance

This etching procedure was then used to etch a silicon wafer under conditions as described for Example 1-13 of the '381 application (see p. 29 of the '381 application).

The etching stability of this solution shown in Table 1.

Table 1

Grade of etching stability	Surface irregularity	Degree of flatness	Gloss	Surface roughness	Total Marks
$\Delta \sim \times$	1	2	2	2	7

The symbols used have the following meanings.

<Etching stability>

- ◎: Stable;
- : Slightly unstable, but practically usable;
- ◇: Stable, but etching speed was low (applicable to etching of (ultra)thin film);
- △: Slightly unstable, and etching speed tended to be too rapid according to kind of wafer etched; and
- ×: Unstable.

More specifically, the evaluation criteria of the above-mentioned etching stability is shown in Table 2.

Table 2

Grade of etching stability	Surface irregularity	Degree of flatness	Gloss	Surface roughness	Total Marks
◎	4	4	4	4	16
○	3	3	4	4	14
◇	3	4	3	4	14
△	2	3	3	3	11
×	1	1	1	1	4

Note:

1) Surface irregularity:

4: None
3: Almost none
2: Few
1: Lot

2) Degree of Fatness:

4: Very good
3: Good
2: Poor
1: Bad

3) Gloss:

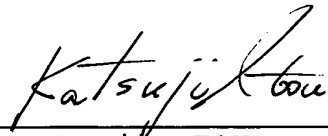
4: Very good
3: Good
2: Poor
1: Bad

4) Surface roughness:

4: Very good
3: Good
2: Poor
1: Bad

3. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title XVIII of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: June 9, 2005



Katsuji ITOU